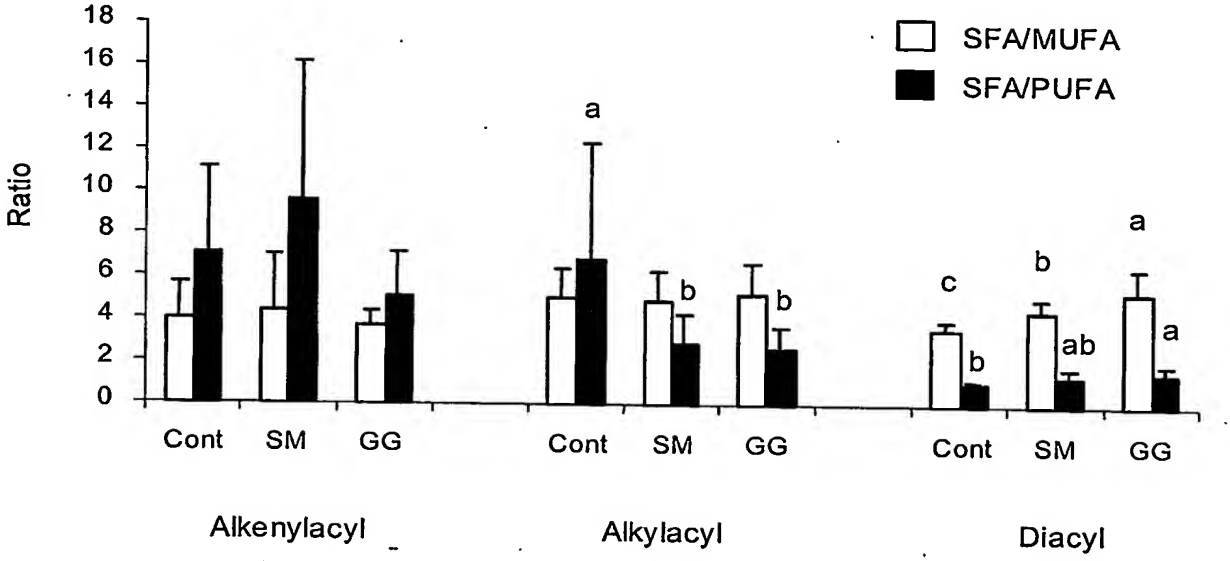
Ratio
18
16
14
12
10
8
6
4
2
0
SFA/MUFA
SFA/PUFA
a
b
b
c
b
b
ab
a
a
Cont
SM
GG
Cont
SM
GG
Cont
SM
GG
Alkenylacyl
Alkylacyl
Diacyl

FIG. 1

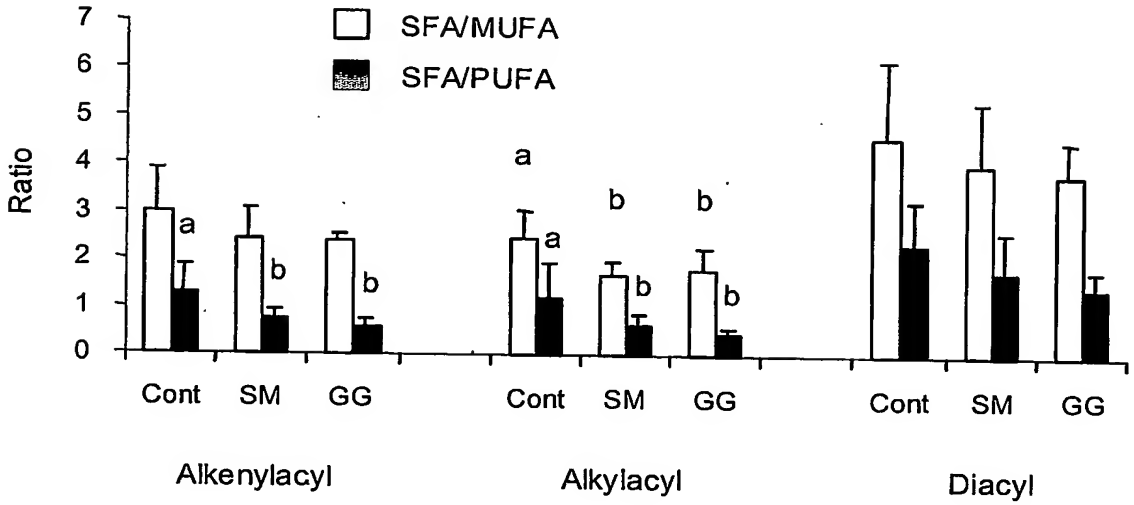
Ratio
7
6
5
4
3
2
1
0
SFA/MUFA
SFA/PUFA
a
b
b
a
b
b
Cont
SM
GG
Cont
SM
GG
Cont
SM
GG
Alkenylacyl
Alkylacyl
Diacyl

FIG. 2

Fatty acid composition of alkenylacyl, alkylacyl and diacyl subclasses in CPG in intestinal mucosa of animals fed control diet or treatment diets[1]

	Alkenylacyl-CPG			Alkylacyl-CPG			Diacyl-CPG		
	Control	SM	GG	Control	SM	GG	Control	SM	GG
C 14:0	6.2 ± 1.6	8.1 ± 5.4	5.0 ± 1.3	5.4 ± 2.1	6.1 ± 2.5	6.4 ± 2.5	0.8 ± 0.2	1.1 ± 0.3	0.9 ± 0.2
C 14:1	1.9 ± 1.5^{a}	0.5 ± 0.3^{b}	0.4 ± 0.6^{b}	1.0 ± 0.7	0.3 ± 0.4	0.5 ± 0.5	-	-	-
C 16:0	33.7 ± 5.8	32.2 ± 8.6	32.3 ± 8.2	34.3 ± 7.3	33.3 ± 6.1	33.0 ± 4.3	21.0 ± 1.7^{b}	24.4 ± 2.2^{a}	24.3 ± 2.5^{a†}
C 16:1(7)	1.4 ± 1.6	0.8 ± 0.5	1.1 ± 1.6	0.4 ± 0.6	0.7 ± 0.6	0.4 ± 0.4	0.4 ± 0.0	0.3 ± 0.2	0.2 ± 0.1
C 18:0	25.5 ± 3.7	23.2 ± 5.9	22.0 ± 6.7	25.8 ± 3.6^{a}	17.6 ± 5.7^{b}	19.0 ± 4.6^{b†}	22.7 ± 1.1^{b}	24.8 ± 3.4^{b}	27.7 ± 3.2^{a†}
C 18:1(9)	8.8 ± 4.3	8.5 ± 4.3	5.9 ± 2.3	8.7 ± 3.1	7.7 ± 1.5	7.4 ± 1.3	11.6 ± 0.8^{a}	10.5 ± 0.8^{b}	9.2 ± 1.1^{c¶}
C 18:2(6)	3.2 ± 1.8	3.2 ± 2.1	2.4 ± 1.6	5.3 ± 4.1	5.5 ± 1.8	5.5 ± 2.9	30.0 ± 1.6^{a}	26.6 ± 3.1^{b}	23.5 ± 3.4^{c‡}
C 18:3(6)	0.5 ± 0.4	1.0 ± 1.2	0.7 ± 0.8	0.8 ± 0.6	0.7 ± 0.4	0.6 ± 0.7	0.1 ± 0.0	0.1 ± 0.1	0.1 ± 0.1
C 18:3(3)	0.5 ± 0.6	0.3 ± 0.2	0.6 ± 0.6	0.5 ± 0.9	0.1 ± 0.2	0.4 ± 0.3	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
C 20:0	1.2 ± 1.2	1.0 ± 0.4	1.9 ± 1.7	1.0 ± 0.2	0.8 ± 0.4	0.9 ± 0.6	0.3 ± 0.0	0.3 ± 0.1	0.3 ± 0.1
C 20:1	0.3 ± 0.4	0.6 ± 0.3	1.0 ± 0.7	0.4 ± 0.3	0.4 ± 0.4	0.6 ± 1.0	0.5 ± 0.1	0.4 ± 0.0	0.4 ± 0.1
C 20:2	0.0 ± 0.1	0.1 ± 0.1	0.7 ± 1.1	0.1 ± 0.3	0.1 ± 0.2	2.6 ± 3.0	0.2 ± 0.1	0.1 ± 0.1	0.2 ± 0.1
C 20:3(6)	0.3 ± 0.4	0.6 ± 0.7	0.4 ± 0.5	0.5 ± 0.6^{b}	1.3 ± 1.3^{a}	0.0 ± 0.1^{b†}	0.4 ± 0.1	0.4 ± 0.1	0.4 ± 0.1
C 20:4(6)	1.8 ± 0.6^{ab}	1.1 ± 0.5^{b}	3.1 ± 2.1^{a}	5.7 ± 3.7	9.5 ± 4.8	9.3 ± 6.7	9.4 ± 0.4	8.8 ± 2.8	10.2 ± 1.5
C 20:3(3)	0.3 ± 0.4	0.9 ± 0.8	0.7 ± 0.8	0.4 ± 0.4	0.4 ± 0.4	0.3 ± 0.4	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
C 20:5(3)	1.5 ± 0.9	0.6 ± 0.6	2.2 ± 2.0	0.7 ± 0.6	0.8 ± 0.5	1.0 ± 0.5	0.3 ± 0.1	0.2 ± 0.1	0.3 ± 0.1
C 22:0	0.5 ± 0.4^{b}	2.6 ± 1.5^{a}	2.2 ± 2.1^{ab}	1.3 ± 0.8	2.2 ± 1.3	1.8 ± 1.0	0.2 ± 0.0	0.2 ± 0.1	0.3 ± 0.2
C 22:1(9)	1.3 ± 1.0	1.5 ± 2.3	1.5 ± 1.6	0.1 ± 0.2^{b}	1.2 ± 1.0^{ab}	1.7 ± 1.5^{a}	0.2 ± 0.0	0.1 ± 0.0	0.2 ± 0.0
C 22:2(6)	2.1 ± 1.1^{ab}	1.5 ± 0.9^{b}	4.0 ± 2.9^{a}	0.0 ± 0.0^{b}	2.9 ± 2.6^{a}	1.2 ± 1.4^{ab†}	0.0 ± 0.0	0.1 ± 0.2	0.1 ± 0.1
C 22:4(6)	0.1 ± 0.3	0.0 ± 0.0	0.0 ± 0.0	0.4 ± 0.4	0.7 ± 0.9	0.6 ± 0.8	0.1 ± 0.1	0.1 ± 0.2	0.1 ± 0.0
C 24:0	2.4 ± 1.5	3.3 ± 1.5	3.2 ± 2.2	1.8 ± 1.0^{a}	1.8 ± 1.0^{a}	0.6 ± 0.8^{b}	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.1
C 22:6(3)	1.2 ± 1.1	0.9 ± 1.1	tr[2]	1.2 ± 1.0^{b}	2.7 ± 0.9^{a}	4.2 ± 1.8^{a‡}	1.4 ± 0.2	1.1 ± 0.4	1.3 ± 0.2
C 24:1(9)	5.3 ± 2.9	7.5 ± 5.4	8.8 ± 3.6	4.0 ± 1.8^{a}	3.0 ± 0.7^{ab}	1.8 ± 1.4^{b}	0.1 ± 0.0	0.1 ± 0.1	0.2 ± 0.1
SFA[3]	69.5 ± 7.3	70.4 ± 10.9	66.6 ± 6.6	69.6 ± 10.6	61.8 ± 9.3	61.7 ± 7.8	45.2 ± 2.3^{b}	50.7 ± 5.5^{a}	53.6 ± 5.8^{a†}
MUFA	19.1 ± 4.8	19.4 ± 7.3	18.7 ± 2.6	14.6 ± 2.5	13.2 ± 1.9	12.4 ± 2.2	12.8 ± 0.9^{a}	11.5 ± 0.9^{b}	10.2 ± 1.1^{c¶}
PUFA	11.4 ± 3.6	10.2 ± 5.2	14.8 ± 4.9	15.8 ± 8.9^{b}	25.0 ± 7.6^{a}	25.9 ± 6.6^{a}	42.0 ± 1.7^{a}	37.7 ± 5.7^{ab}	36.2 ± 4.8^{b}

[1] Means ± SD (% w/w) in 3 subclasses from 7, 8 and 7 animals, for the control, SM and GG group, respectively. Within a row, values with different superscript letters are significantly different at $P < 0.05$. Superscript letters with †, ‡ and ¶ are significantly different at $P<0.01$, $P<0.001$, and $P<0.0001$, respectively. [2] tr represents trace amount.
[3] SFA, MUFA and PUFA represent saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids, respectively.

FIG. 3

Fatty acid composition of alkenylacyl, alkylacyl and diacyl subclasses in EPG in intestinal mucosa of animals fed control diet or treatment diets[1]

	Alkenylacyl-EPG			Alkylacyl-EPG			Diacyl-EPG		
	Control	SM	GG	Control	SM	GG	Control	SM	GG
C 14:0	3.9 ± 1.3	3.1 ± 1.1	3.1 ± 1.2	4.4 ± 1.5	3.0 ± 1.9	2.5 ± 1.5	0.7 ± 0.4	0.4 ± 0.1	0.5 ± 0.2
C 14:1	0.7 ± 0.3	0.9 ± 1.0	0.5 ± 0.4	0.7 ± 0.6^{a}	0.2 ± 0.2^{b}	0.2 ± 0.1^{b}	-	-	-
C 16:0	19.0 ± 3.6^{a}	15.4 ± 1.7^{b}	14.2 ± 2.3^{b†}	18.7 ± 5.4^{a}	12.7 ± 3.2^{b}	11.4 ± 1.9^{b†}	9.8 ± 2.5	8.5 ± 1.8	8.1 ± 1.9
C 16:1(7)	2.1 ± 1.3	2.5 ± 0.7	2.3 ± 0.6	0.6 ± 0.5	0.3 ± 0.2	0.3 ± 0.3	0.1 ± 0.1	0.1 ± 0.1	0.1 ± 0.0
C 18:0	17.6 ± 4.7^{a}	14.4 ± 4.1^{ab}	11.6 ± 2.7^{b}	14.8 ± 3.2^{a}	11.2 ± 4.0^{b}	9.8 ± 2.1^{b}	46.9 ± 8.6	43.5 ± 7.4	42.6 ± 4.3
C 18:1(9)	9.0 ± 2.0	8.2 ± 1.2	7.3 ± 0.9	12.0 ± 3.1	11.6 ± 1.9	9.2 ± 1.3	12.2 ± 2.9	13.1 ± 2.1	12.8 ± 1.5
C 18:2(6)	4.0 ± 1.3	4.6 ± 0.5	4.1 ± 0.7	5.4 ± 1.0	6.4 ± 0.6	5.6 ± 0.8	11.8 ± 3.3	14.7 ± 3.0	14.2 ± 1.8
C 18:3(6)	0.6 ± 0.3^{a}	0.6 ± 0.1^{a}	0.3 ± 0.1^{b}	0.5 ± 0.4	0.5 ± 0.3	0.4 ± 0.2	0.2 ± 0.1	0.1 ± 0.1	0.2 ± 0.0
C 18:3(3)	2.2 ± 1.2	2.1 ± 0.9	2.1 ± 1.0	0.5 ± 0.3	0.6 ± 0.3	0.6 ± 0.2	0.3 ± 0.5	0.2 ± 0.1	0.1 ± 0.0
C 20:0	0.6 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	1.6 ± 1.2	1.1 ± 0.2	1.1 ± 0.1	0.5 ± 0.2	0.5 ± 0.1	0.3 ± 0.3
C 20:1	1.0 ± 0.8	1.0 ± 0.2	0.8 ± 0.1	2.1 ± 1.2	2.1 ± 0.4	2.1 ± 0.5	0.3 ± 0.1	0.2 ± 0.1	0.2 ± 0.1
C 20:2	1.2 ± 1.4	0.5 ± 0.7	1.1 ± 0.9	0.4 ± 0.3	0.5 ± 0.3	0.7 ± 0.3	0.4 ± 0.6	0.2 ± 0.1	0.1 ± 0.0
C 20:3(6)	0.8 ± 0.6	0.9 ± 0.3	0.9 ± 0.2	1.0 ± 0.5	1.2 ± 0.6	1.6 ± 0.5	0.4 ± 0.2	0.5 ± 0.2	0.4 ± 0.3
C 20:4(6)	16.9 ± 5.7	21.3 ± 3.9	23.1 ± 4.9	18.5 ± 6.1^{b}	21.9 ± 4.6^{ab}	25.1 ± 2.6^{a}	11.5 ± 3.6^{b}	14.0 ± 3.5^{ab}	15.7 ± 2.6^{a†}
C 20:3(3)	0.5 ± 0.2^{a}	0.3 ± 0.2^{ab}	0.2 ± 0.1^{b}	0.4 ± 0.2	0.4 ± 0.2	0.3 ± 0.2	0.1 ± 0.1	0.1 ± 0.1	0.0 ± 0.0
C 20:5(3)	0.6 ± 0.3	0.4 ± 0.3	0.5 ± 0.2	0.8 ± 0.3	0.7 ± 0.4	0.6 ± 0.3	0.3 ± 0.1	0.3 ± 0.2	0.2 ± 0.2
C 22:0	1.3 ± 0.7	1.0 ± 0.6	0.9 ± 0.2	0.7 ± 0.6	0.7 ± 0.5	1.2 ± 0.9	0.5 ± 0.2	0.3 ± 0.1	0.4 ± 0.2
C 22:1(9)	0.4 ± 0.4	0.4 ± 0.4	0.8 ± 0.8	0.5 ± 0.5	1.1 ± 0.9	1.0 ± 1.1	0.3 ± 0.4	0.2 ± 0.1	0.2 ± 0.1
C 22:2(6)	1.2 ± 1.5	0.5 ± 0.2	0.7 ± 0.3	1.5 ± 0.9	1.6 ± 1.1	1.2 ± 0.5	0.4 ± 0.3^{a}	0.0 ± 0.0^{b}	0.0 ± 0.1^{b‡}
C 22:4(6)	4.9 ± 2.8^{b}	7.8 ± 1.6^{a}	9.9 ± 2.1^{a‡}	5.8 ± 2.3^{b}	8.3 ± 2.9^{ab}	10.9 ± 2.2^{a†}	0.3 ± 0.2	0.4 ± 0.2	0.6 ± 0.5
C 24:0	2.3 ± 1.9	1.4 ± 0.7	0.9 ± 0.5	1.4 ± 0.4^{a}	1.6 ± 0.7^{a}	0.7 ± 0.5^{b}	0.2 ± 0.1	0.2 ± 0.1	0.3 ± 0.2
C 22:6(3)	7.4 ± 2.6^{c}	10.1 ± 0.9^{b}	12.7 ± 1.8^{a‡}	6.3 ± 1.9^{b}	9.2 ± 2.3^{a}	11.2 ± 1.2^{a‡}	2.0 ± 1.0	2.3 ± 1.1	2.7 ± 0.5
C 24:1(9)	2.5 ± 1.4	2.3 ± 1.5	1.5 ± 1.1	1.3 ± 0.7	2.6 ± 1.6	2.4 ± 2.3	0.6 ± 0.5	0.3 ± 0.1	0.2 ± 0.1
SFA[2]	44.7 ± 9.7^{a}	35.7 ± 5.9^{b}	31.2 ± 5.5^{b†}	41.6 ± 9.8^{a}	30.2 ± 7.1^{b}	26.7 ± 4.4^{b†}	58.6 ± 9.8	53.3 ± 8.8	50.4 ± 4.9
MUFA	15.7 ± 4.2	15.2 ± 2.5	13.2 ± 2.1	17.2 ± 3.0	17.9 ± 2.8	15.2 ± 2.4	13.6 ± 2.8	13.9 ± 2.1	13.4 ± 1.1
PUFA	39.4 ± 11.3^{b}	49.1 ± 5.4^{a}	55.6 ± 7.4^{a†}	41.2 ± 11.5^{b}	51.9 ± 9.4^{a}	58.1 ± 4.2^{a†}	27.8 ± 7.4^{b}	32.8 ± 7.0^{ab}	36.2 ± 4.2^{a}

[1] Means ± SD (% w/w) in 3 subclasses from 7, 8 and 7 animals, for the control, SM and GG group, respectively. Within a row, values with different superscript letters are significantly different at $P<0.05$. Superscript letters with †, ‡, and ¶ are significantly different at $P<0.01$, $P<0.001$, and $P<0.0001$, respectively.

[2] SFA, MUFA and PUFA represent saturated fatty acids, mono unsaturated fatty acids and poly unsaturated fatty acids, respectively.

FIG. 4

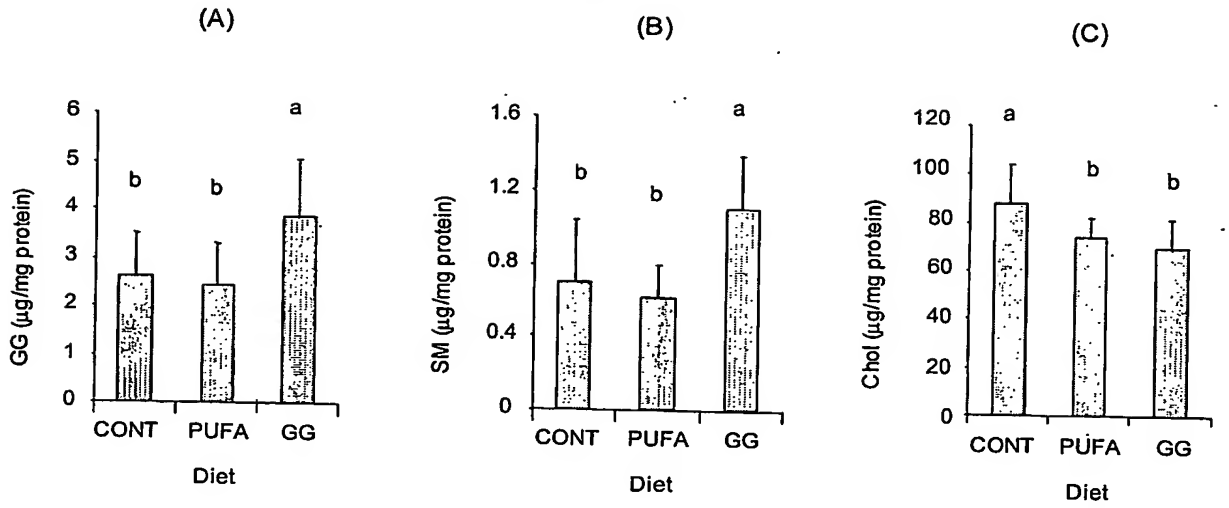
(A)
GG (µg/mg protein)
6
5
4
3
2
1
0
b
b
a
CONT
PUFA
GG
Diet
(B)
SM (µg/mg protein)
1.6
1.2
0.8
0.4
0
b
b
a
CONT
PUFA
GG
Diet
(C)
Chol (µg/mg protein)
120
100
80
60
40
20
0
a
b
b
CONT
PUFA
GG
Diet

FIG. 5

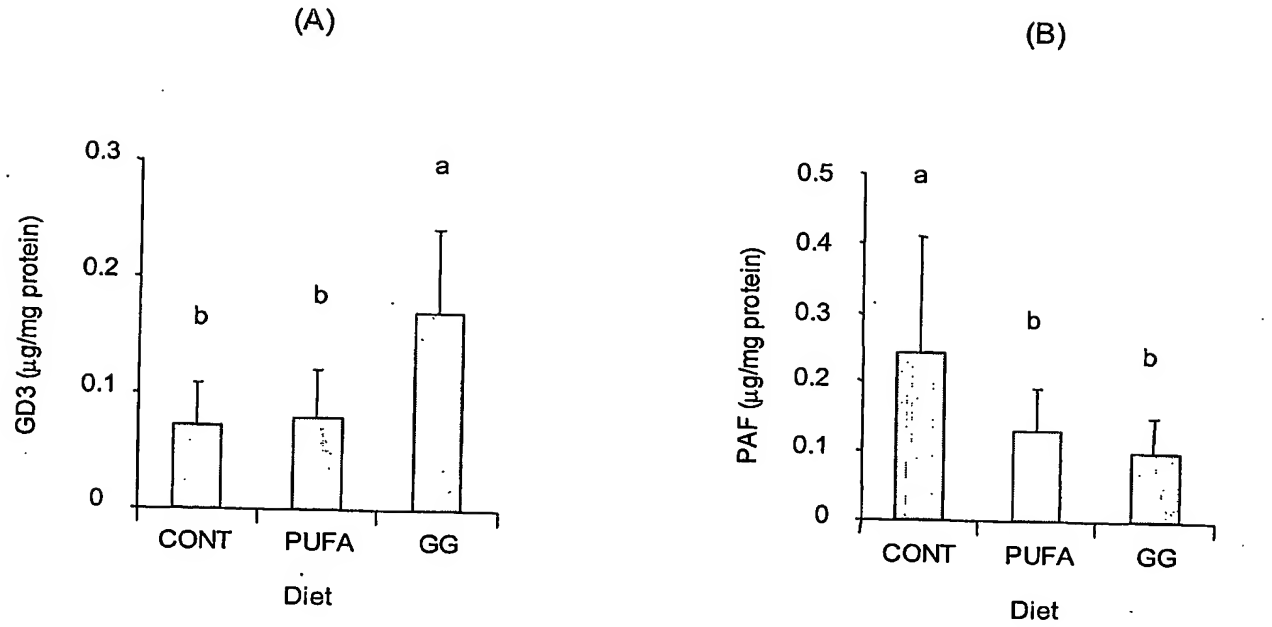
(A)
GD3 (µg/mg protein)
0.3
0.2
0.1
0
b
b
a
CONT
PUFA
GG
Diet
(B)
PAF (µg/mg protein)
0.5
0.4
0.3
0.2
0.1
0
a
b
b
CONT
PUFA
GG
Diet

FIG. 6

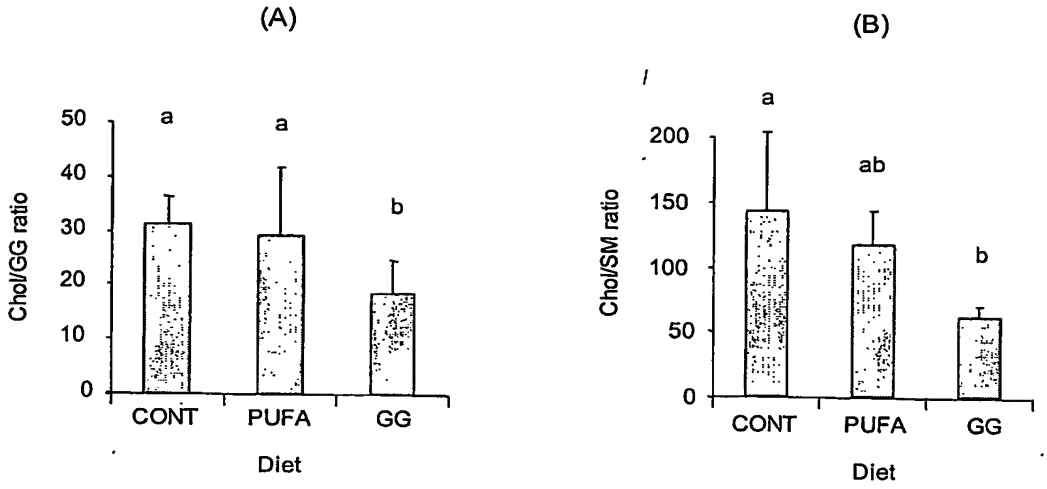
(A)
Chol/GG ratio
50
40
30
20
10
0
a
a
b
CONT
PUFA
GG
Diet
(B)
Chol/SM ratio
200
150
100
50
0
a
ab
b
CONT
PUFA
GG
Diet

FIG. 7

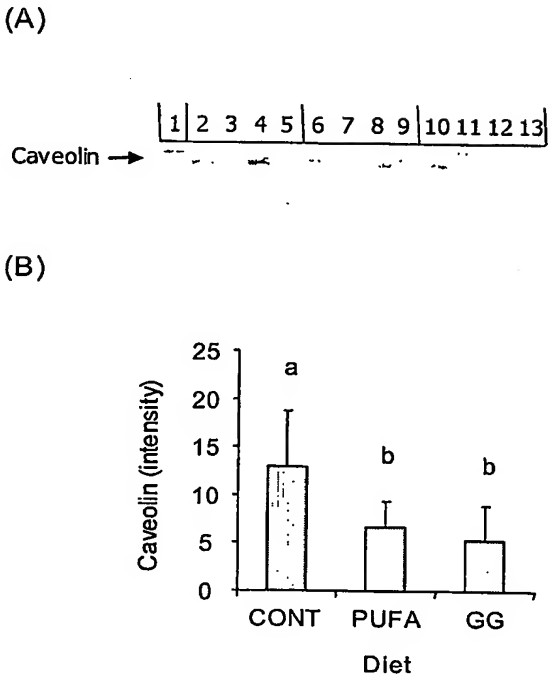
(A)
1 2 3 4 5 6 7 8 9 10 11 12 13
Caveolin
(B)
Caveolin (intensity)
25
20
15
10
5
0
a
b
b
CONT
PUFA
GG
Diet

FIG. 8

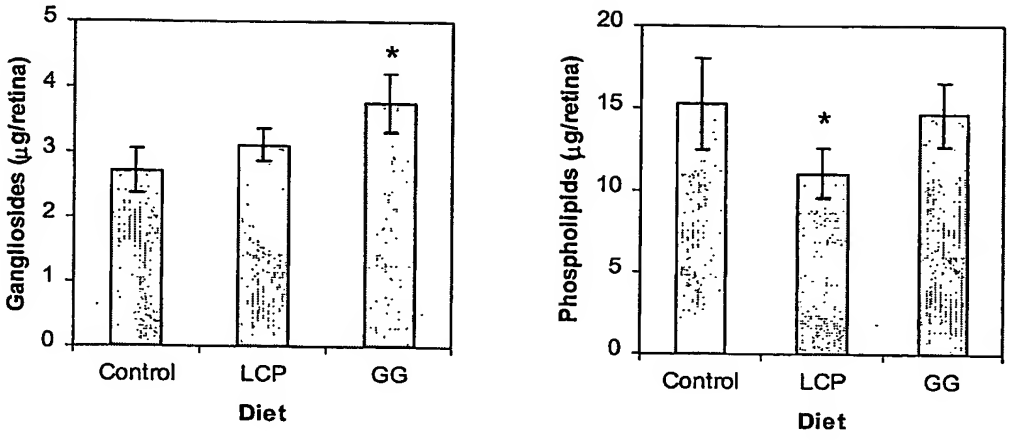
Gangliosides (µg/retina)
5
4
3
2
1
0
*
Control
LCP
GG
Diet
Phospholipids (µg/retina)
20
15
10
5
0
*
Control
LCP
GG
Diet

FIG. 9

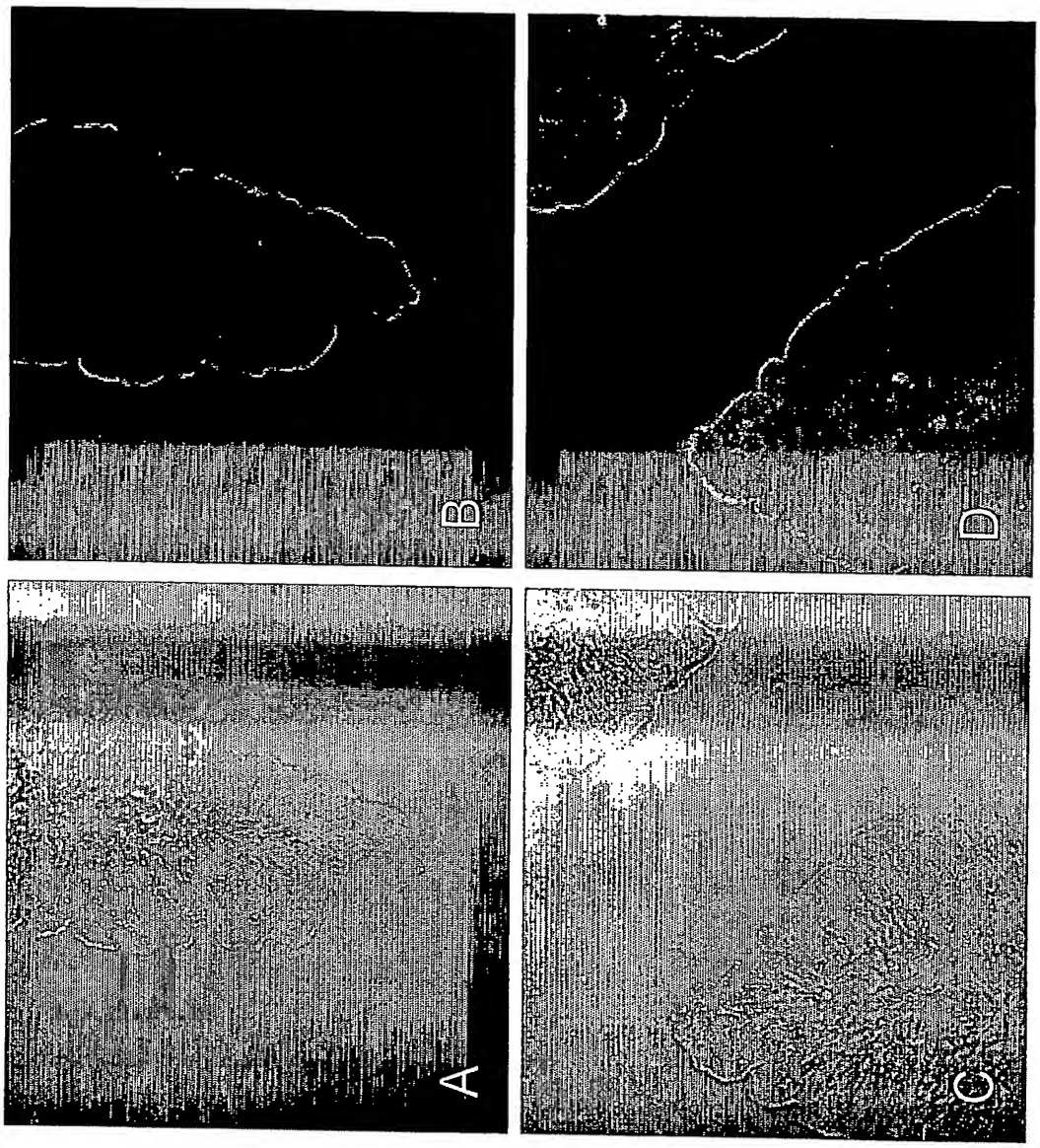

FIG. 10

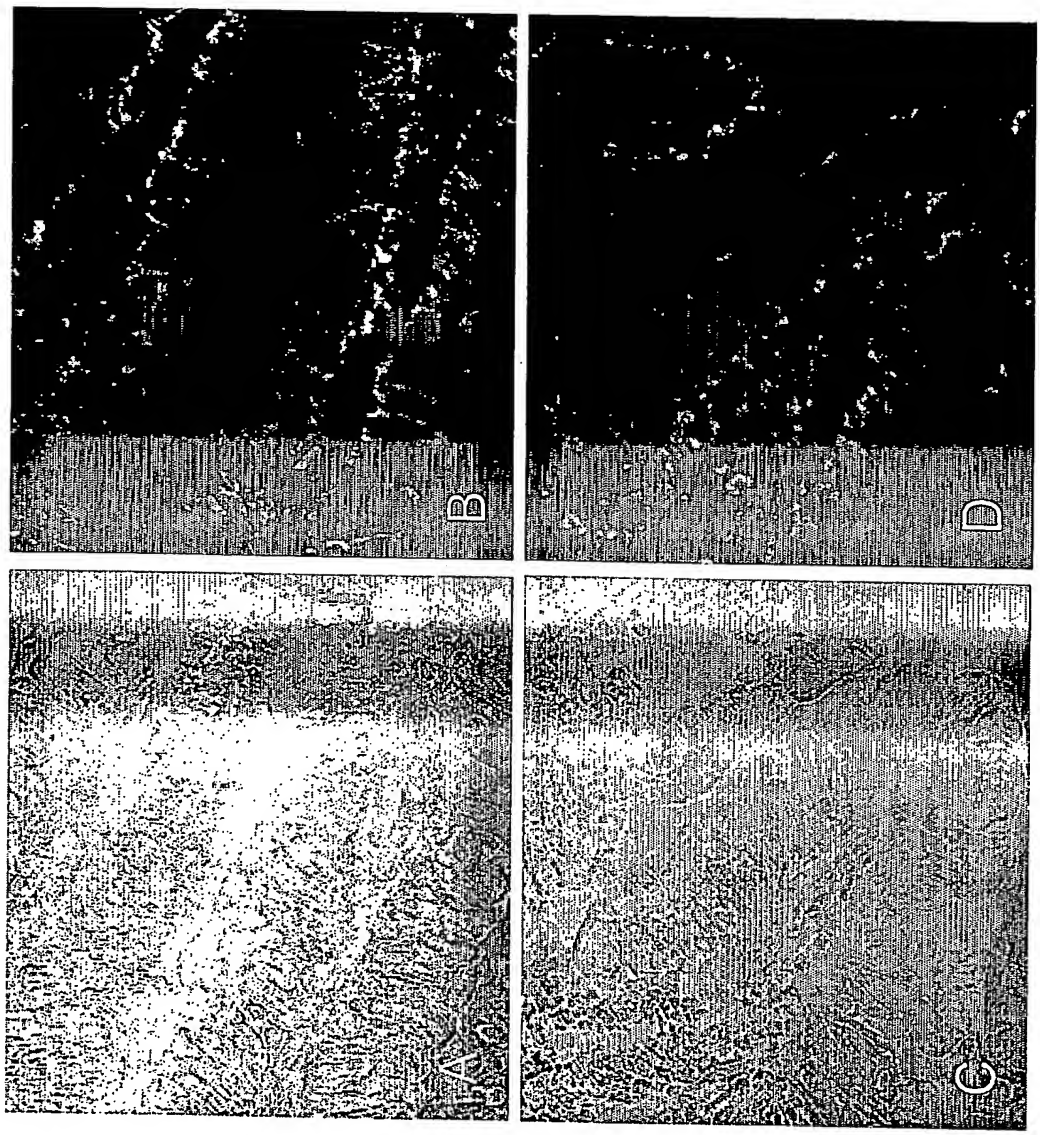

FIG. 11

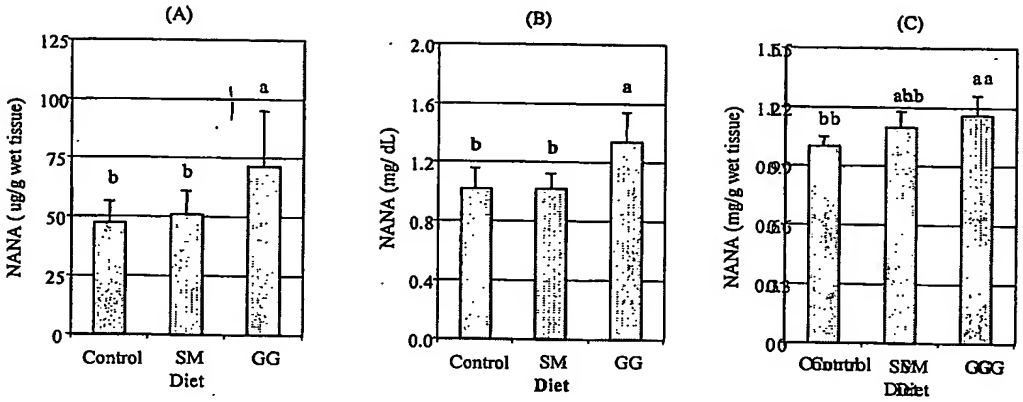
(A)
NANA (ug/g wet tissue)
125
100
75
50
25
0
b
b
a
Control
SM
GG
Diet
(B)
NANA (mg/ dL)
2.0
1.6
1.2
0.8
0.4
0.0
b
b
a
Control
SM
GG
Diet
(C)
NANA (mg/g wet tissue)
bb
abb
aa
Control
SM
GG
Diet

FIG. 12

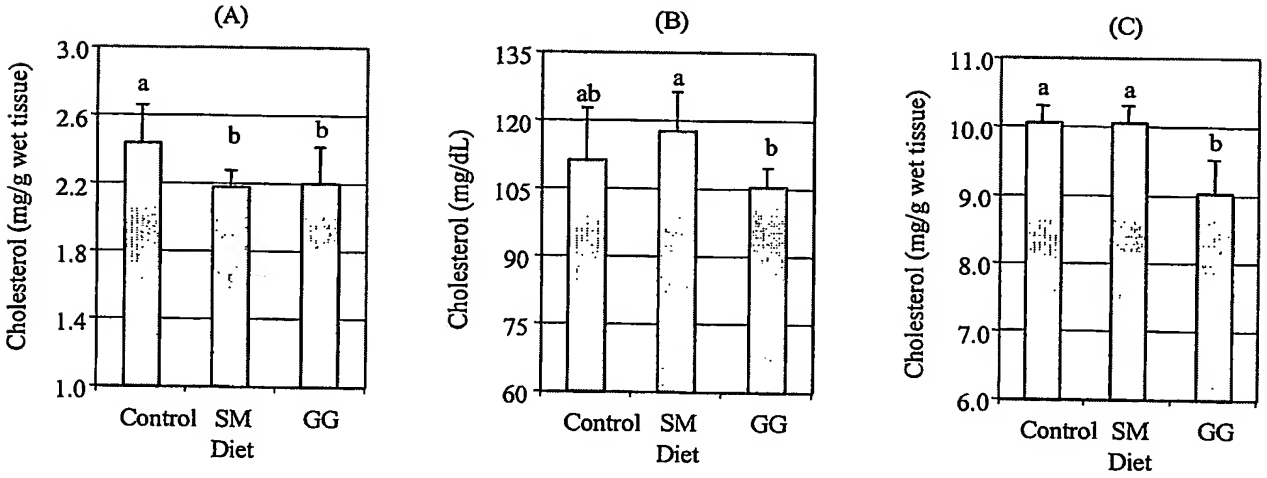
(A)
Cholesterol (mg/g wet tissue)
3.0
2.6
2.2
1.8
1.4
1.0
a
b
b
Control
SM
GG
Diet
(B)
Cholesterol (mg/dL)
135
120
105
90
75
60
ab
a
b
Control
SM
GG
Diet
(C)
Cholesterol (mg/g wet tissue)
11.0
10.0
9.0
8.0
7.0
6.0
a
a
b
Control
SM
GG
Diet

FIG. 13

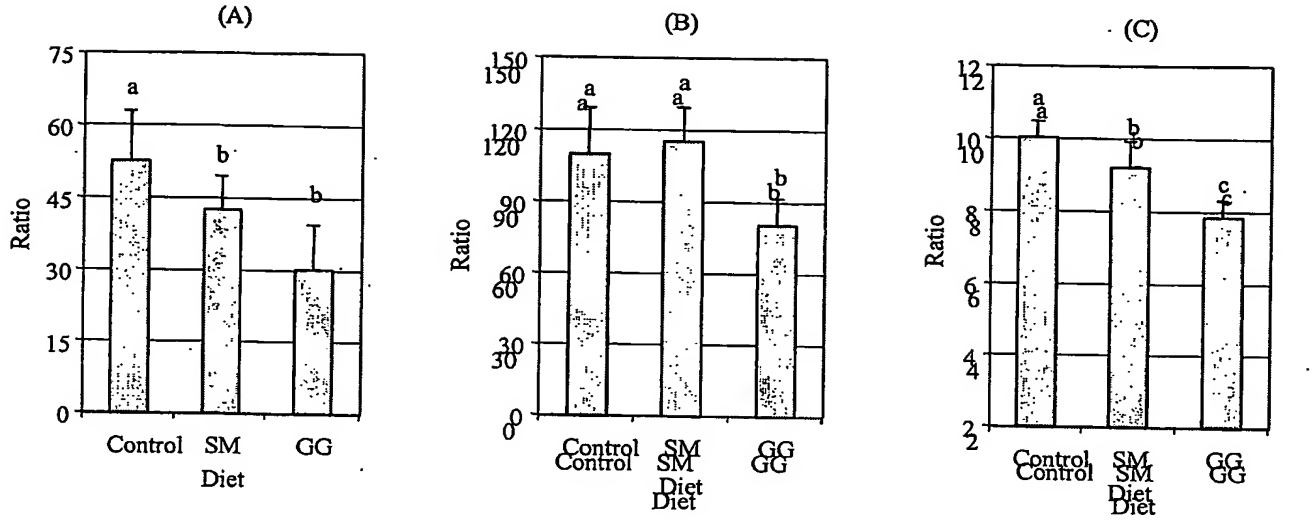
(A)
Ratio
75
60
45
30
15
0
a
b
b
Control
SM
GG
Diet
(B)
Ratio
150
120
90
60
30
0
a
a
b
Control
SM
GG
Diet
(C)
Ratio
12
10
8
6
4
2
a
b
c
Control
SM
GG
Diet

FIG. 14

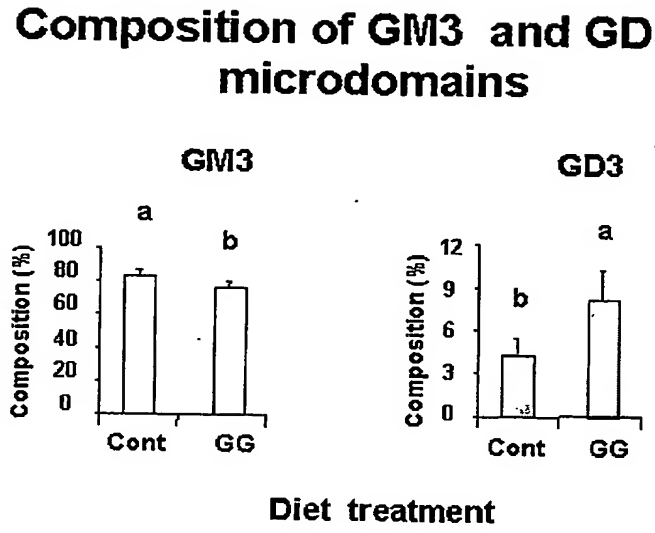
Composition of GM3 and GD3 in microdomains
GM3
GD3
a
b
a
b
Composition (%)
100
80
60
40
20
0
12
9
6
3
0
Cont
GG
Diet treatment

FIG. 15

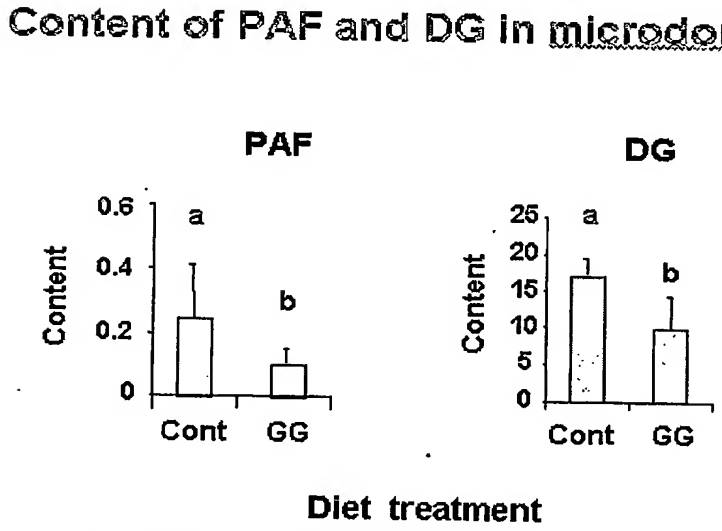
Content of PAF and DG in microdomains
PAF
DG
a
b
a
b
Content
0.6
0.4
0.2
0
25
20
15
10
5
0
Cont
GG
Diet treatment
Content is presented by ug/mg protein

FIG. 16

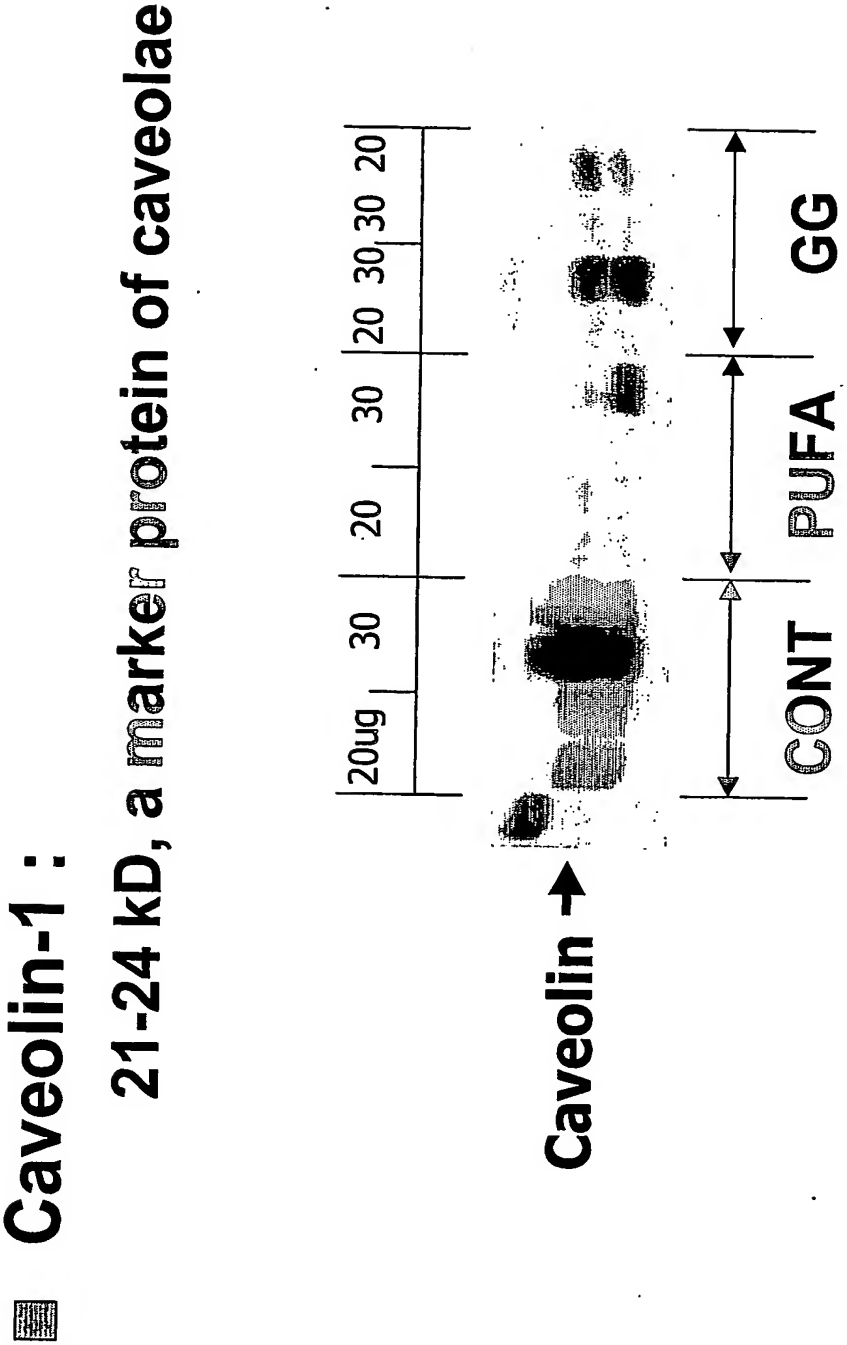
Caveolin-1 :
21-24 kD, a marker protein of caveolae
20ug
30
20
30
20
30
20
Caveolin
CONT
PUFA
GG

FIG. 17

Diet group/Statistical P value	Control	SM	GG	P
NANA (mg/DL)	1.02 ± 0.14^{b}	1.02 ± 0.10^{b}	1.34 ± 0.20^{a}	0.003
Phosphorus (mg/DL)	6.83 ± 0.71	6.92 ± 0.34	6.81 ± 0.22	-
Cholesterol (mg/DL)	111.3 ± 11.4^{ab}	117.8 ± 8.5^{a}	105.4 ± 4.2^{b}	0.03
Triglyceride (mg/DL)	94.7 ± 27.0^{ab}	107.1 ± 18.5^{a}	76.8 ± 10.5^{b}	0.02
NANA/P ratio (mg/mg)	0.15 ± 0.02^{b}	0.15 ± 0.02^{b}	0.20 ± 0.03^{a}	0.006
Cholesterol/NANA ratio (mg/mg)	110.1 ± 19.1^{a}	115.5 ± 14.1^{a}	80.4 ± 11.2^{b}	0.002
Cholesterol/P ratio (mg/mg)	16.26 ± 1.23^{ab}	16.97 ± 1.05^{a}	15.34 ± 0.72^{b}	0.06

FIG. 18